

Leptonerilla diplocirrata, a new genus and species of interstitial polychaetes from the island of Hainan, south China (Nerillidae)

Wilfried Westheide and Günter Purschke

University of Osnabrück, Fachbereich Biologie/Chemie, Spezielle Zoologie,
D-49069 Osnabrück, Germany

Abstract.—A new nerillid polychaete, *Leptonerilla diplocirrata*, new genus and species, is described from subtidal sandy sediments of Hainan Island, China. The species possesses the maximal number of prostomial appendages observed in the taxon: three antennae and one pair of palps. The body is composed of 9 segments, all of which bear cirri and compound chaetae. With the exception of one species it differs from hitherto known nerillids by the presence of two cirri on the parapodia of segments 2 to 9. This most disparate character is considered to be primitive for the family Nerillidae: it is the decisive diagnostic character of the new genus, which now also includes *Leptonerilla prospera* (Sterrer & Iliffe 1982).

The Nerillidae are all very small polychaetes with a constant number of segments in each species: they are distributed worldwide, predominantly in the interstices of coarse sediments in intertidal and subtidal areas. The only species of this family previously reported for the Chinese coastline is *Nerilla sinica* Wu and Chen, 1980 (Wu & He 1994). However, it is most likely that the number of species here is no less than in other coastal regions of the earth, and that the reason more of them have not been discovered is the paucity of research directed specifically to the meiofauna. Other meiofaunal genera, though previously documented only occasionally or not at all in this region, have been found in abundance when a concentrated search is made (see, e.g., Zhao & Wu 1991, Wu & Zhao 1992, Ding & Westheide 1994, Westheide et al. 1994). These records derive from several expeditions carried out since 1987 as part of a joint project between the First Institute of Oceanography in Qingdao and the Biology Department of the University of Osnabrück. In the course of these collecting trips the nerillid species introduced here was found off the island Hainan in the

south of China. It is especially interesting because it exceeds all previously described genera in the profusion of its external structures and hence appears especially primitive.

Methods

Extraction was carried out with a MgCl₂ solution isotonic to seawater (for details see Westheide & Purschke 1988). First microscopic investigation and tracing with a camera lucida took place when the animals were still alive. For a more detailed observation one fixed specimen (with SPAFG) was whole mounted in Zeiss W15 medium.

Leptonerilla, new genus

Diagnosis.—Three thread-like antennae. Two palps. Nine chaetigerous segments. Parapodia with two cirri except in the first segment with only one. Chaetae jointed. Two long anal cirri.

Etymology.—“Lepto” is a greek prefix for “thin, small, minute” to which “-nerilla” is attached referring to a nerillid.

Leptonerilla diplocirrata, new species

Fig. 1

Material examined.—Living specimens came from a subtidal patch of sand between coral reefs, 2–3 m deep, Hainan Island, South China Sea: near Island Xizhou off Sanya (18°14'N, 109°30'E), 19 Oct 1991.

Type material.—Holotype is a whole mount of the single mature specimen, deposited in the Senckenberg Museum, Frankfurt (No. SMF 5300).

Description.—Almost colorless. Length ca. 690 μm . Width between segments 1 and 2: 56 μm , between segments 4 and 5: 90 μm (parapodial cirri not included). Separation of the relatively short prostomium from the trunk not distinctly visible (Fig. 1A). With three thread-like, more or less smooth, non-jointed antennae; the median one somewhat longer (ca. 250 μm) than the lateral antennae (ca. 215 μm); antennae positioned in a semicircle directly above the anterior margin of the prostomium. Two ventrolaterally positioned spoon-shaped palps (length ca. 56 μm); partly ciliated. Two eyes, probably with lenses. Two lateral ciliary tufts behind the palps indicate the nuchal organs.

Trunk with 9 chaetigerous segments, the posteriormost ones shortest. Parapodial cirri thread-like, resembling the antennae. Conspicuous constriction of the trunk between first and second segment. First chaetigerous segment (buccal segment or peristomium) different, in possessing only one relatively short (length ca. 50 μm) posteriorly bent parapodial cirrus on each side and in having the two chaetal bundles each conspicuously directed backwards. Parapodia in the following segments with two cirri each, positioned one above the other between the dorsal and the ventral bundle of chaetae. Dorsal and ventral cirri differing in length, the ventral one longer than the dorsal cirrus, especially obvious in chaetiger 2 (185 μm to 85 μm), and chaetiger 9 (215 μm to 130 μm). Chaetae all jointed (compound) (Fig. 1C) of identical shape and mostly equal in

size, except for single simple capillary chaetae (Fig. 1B), which were found in the dorsal bundle of segments 1 and 4. Number of jointed chaetae per bundle differing between segments; highest number (more than 10) in the first segment and in segments 6 to 8; lowest numbers (1 or 2) in segments 3 and 4.

Pygidium rather narrow (width ca. 25 μm), ventrally with very short appendage, dorsally with two long (ca. 270 μm) thread-like anal cirri. Pharyngeal bulb possessing two (?) buccal pieces, not clearly visible. One vitellogenic oocyte (length: ca. 80 μm) positioned in segments 6 and 7; no other details of reproductive organs discernible.

Etymology.—The species name refers to the presence of two cirri in the parapodial structures.

Discussion

As in the case of the small Dinophilidae (Westheide 1985, Eibye-Jacobsen & Kristensen 1994), a progenetic origin can also be inferred for the Nerillidae. However, there is strong evidence that the Dinophilidae are closely related to the Dorvilleidae, which makes it likely that these two groups are paedomorphic Eunicida; in contrast, the Nerillidae do not resemble any juvenile stages of extant polychaetes in any obvious respects. The most that can be said is that the body configuration of juvenile Onuphidae (Hsieh & Simon 1987) is at least superficially consistent with that of the nerillids. Apart from these considerations, for every group of morphologically distinct paedomorphic species there remains the practically insoluble question whether they originated from a single progenetically evolved stem species or evolved independently several times by progenesis from different though closely related macrofaunal species (Westheide 1987). Only in the first case is it possible to describe a phylogenetic sequence and to construct a cladogram that illustrates the phylogenetic relationships. With this qualification, we shall briefly discuss the

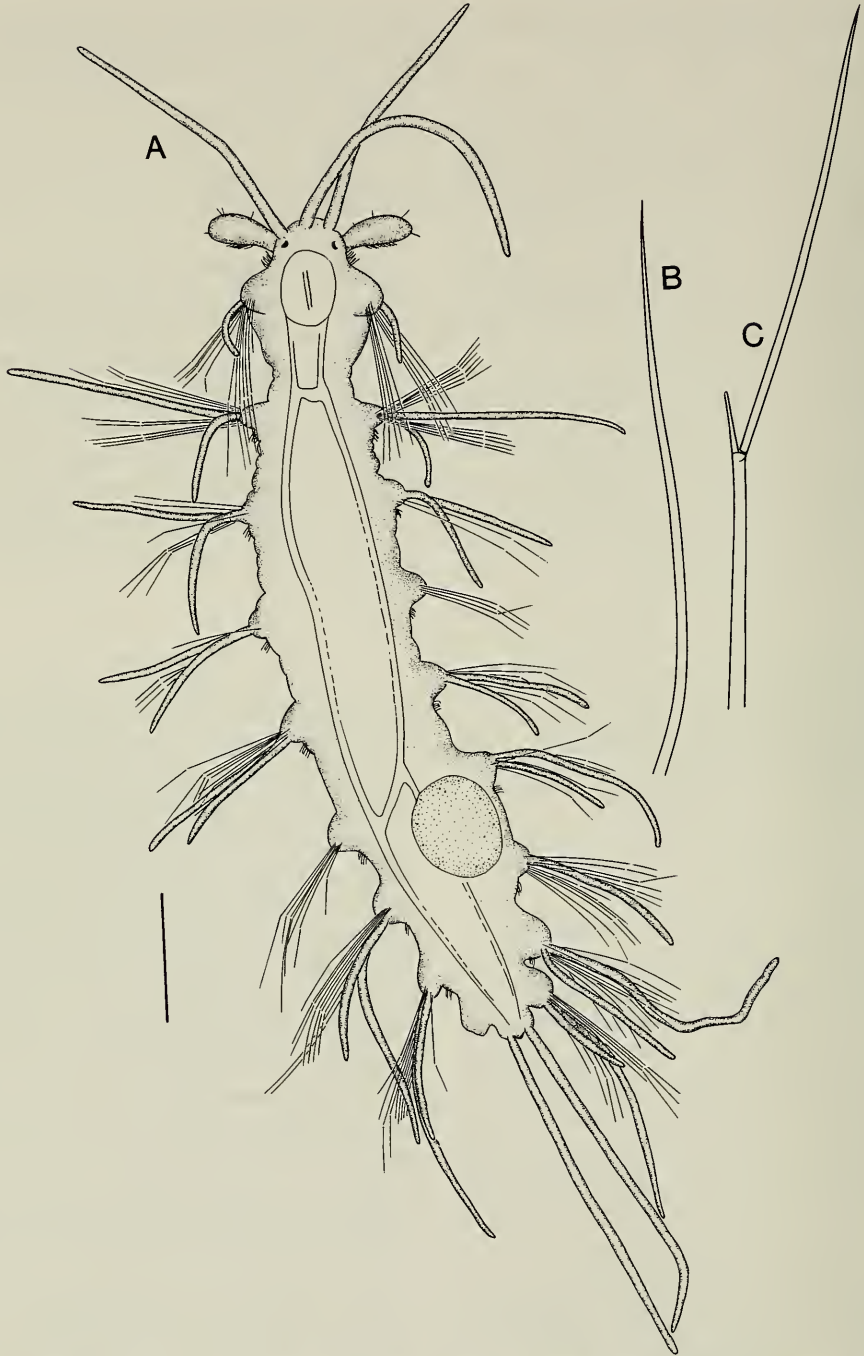


Fig. 1. *Leptonerilla diplocirrata*, new genus and species. A, dorsal view of living specimen, scale = 100 μm ; B, simple chaeta; C, compound chaeta.

phylogenetic position of the new taxon. Assuming further that the postulated progenetic stem species was the least paedomorphic in general structure (admittedly an a priori assumption unsupported by any fundamental arguments), a nerillid species particularly close to the stem species ought to have a relatively complex configuration, with larger numbers of segments and of appendages, more complex and numerous chaetae, etc.

By these criteria, the new species presented here is the most primitive nerillid yet known, one that would be especially close to the stem species, as follows. The prostomium has the greatest number of antennae (3) and palps (2) known for the Nerillidae (Westheide 1990); the body is composed of the maximal number of segments (9), all of which bear cirri and chaetae; anal cirri are present; the chaetae are jointed; and there are also a few simple chaetae. The appendages are the same as are present in the various *Mesonerilla* species (e.g., *M. intermedia* Wilke, 1953) (Westheide 1990). A disparate character, which could be considered especially primitive, is the presence of two cirri on the parapodia of each of the segments 2 to 9; like the two bundles of chaetae, these can be interpreted as indicating a biramous structure of the parapodia in the macrofaunal species from which the Nerillidae are derived. The attempt to homologize these cirri with specific structures of typical biramous parapodia, such as the neuropodial or notopodial cirri or lobes, would be premature. Two cirri have been reported for some of the individuals in a population of *Micronerilla minuta* (Swedmark, 1959) (Jouin 1970); they occurred in segments 2 to 6 (Westheide 1990), an indication that this otherwise distinctly different and more highly evolved form originated from a species with double cirri like the new species presented. Another form with two cirri on just the same segments, 2 to 9, is *Mesonerilla prospera* Sterrer & Iliffe, 1982 from inland marine caves of Bermuda. These animals are relatively close to the new species in also possessing 9 chae-

tigerous segments, 3 threadlike antennae, and compound chaetae, but they differ distinctly in their morphometric data: their length ranges from 1500–2050 μm , their maximum width is 250–420 μm , the median antenna is up to 650 μm long, the palps have a length of 230 μm and that of the parapodial cirri is 550 μm . The single cirri of the parapodia of the first segment, however, are much shorter (30 μm), as are the anal cirri, with a length of only 120 μm . Hence, this Bermudan species is one of the largest nerillids, and the females were observed to carry up to 8 mature eggs with a diameter of up to 200 μm (Sterrer & Iliffe 1982). Because this species is consistent with the new genus *Leptonerilla* with respect to the decisive diagnostic character, the possession of two cirri in the chaetigerous segments 2 to 9, we likewise assign it to this genus: *Leptonerilla prospera* (Sterrer & Iliffe, 1982).

Acknowledgments

The authors express their thanks to Professor Wu Baoling, Honorary Director of the First Institute of Oceanography in Qingdao, for making possible their stay on Hainan Island, and for his continuous support of the joint project. They thank Xiong Shi Lin, Vice Director, Oceanic Administration of Hainan Province, for his hospitality. They are grateful to Huang Fengpeng for his continuous help during their stay on Hainan, especially to Ding Zhihu for performing the arduous task of diving for sand samples off the coast of Hainan. Thanks are also due to Anna Stein, who prepared the drawings, to Andrea Noël for her help in preparing the manuscript and to Monika C. Müller for a most valuable suggestion. A travel grant from the German Federal Ministry of Technology and Research and the kind assistance of Mrs. E. Hongsernant (DLR, Köln) are also gratefully acknowledged.

Literature Cited

- Ding, Z., & W. Westheide. 1994. Two new interstitial *Streptosyllis* species from South China (Poly-

- chaeta: Syllidae).—*Microfauna Marina* 9:303–312.
- Eibye-Jacobsen, D., & R. M. Kristensen. 1994. A new genus and species of Dorvilleidae (Annelida, Polychaeta) from Bermuda, with a phylogenetic analysis of Dorvilleidae, Iphitimidae and Dinophilidae.—*Zoologica Scripta* 23:107–131.
- Hsieh, H.-L. & J. L. Simon. 1987. Larval development of *Kinbergonuphis simoni*, with a summary of development patterns in the family Onuphidae (Polychaeta).—*Bulletin of the Biological Society of Washington* 7:194–210.
- Jouin, C. 1970. Recherches sur les Archiannelides interstitielles: Systématique, anatomie et développement des Protodrilidae et des Nerillidae. Unpublished Thèse Doctorat, Faculté des Sciences de Paris, pp. 1–204.
- Sterrer, W., & T. M. Iliffe. 1982. *Mesonerilla prospera*, a new archiannelid from marine caves in Bermuda.—*Proceedings of the Biological Society of Washington* 95:509–514.
- Westheide, W. 1985. The systematic position of the Dinophilidae and the archiannelid problem. Pp. 310–326 in S. Conway Morris, J. S. George, R. Gibson, & H. M. Platt, eds., *The origin and relationships of lower invertebrates*. Clarendon Press, Oxford, 397 pp.
- . 1987. Progenesis as a principle in meiofauna evolution.—*Journal of Natural History* 21:843–854.
- . 1990. Polychaetes: Interstitial families.—*Synopsis of the British Fauna (New Series)*: 1–152. Universal Book Services/Dr. W. Backhuys, Oegstgeest, 152 pp.
- , & G. Purschke. 1988. Organism processing. Pp. 146–160 in R. P. Higgins & H. Thiel, eds., *Introduction to the study of meiofauna*. Smithsonian Institution Press, Washington, D. C., London, 488 pp.
- , ———, & W. Mangerich. 1994. The interstitial hesionid *Sinohesion genitaliphora* gen. et. sp. n. (Annelida, Polychaeta) together with a description of its dimorphous genital organs.—*Zoologica Scripta* 23:95–105.
- Wu, B., & J. Zhao. 1992. Preliminary studies on species of Hesionidae (Polychaeta) from Yellow Sea.—*Journal of Oceanography of Huanghai and Bohai Seas* 10:36–41.
- Wu, Q., & M. He. 1994. Polychaeta. Pp. 343–375 in Z. Huang, ed., *Marine species and their contributions in China's seas*. China Ocean Press, Beijing, 764 pp.
- Zhao, J., & B. Wu. 1991. A new interstitial polychaete *Hesionura shangdongensis* sp. n. (Polychaeta: Pisionidae) from Yantai; the Huanghai Sea.—*Acta Oceanologica Sinica* 10:447–450 (in Chinese, English abstract).